

Previous-year - JEE Questions and solutions.

① Which of the following sets of quantum numbers is correct for electron present in 4f orbital

1) $n=4, l=3, m=+4, s=+1/2$

2) $n=4, l=2, m=-2, s=+1/2$

3) $n=4, l=3, m=+1, s=+1/2$

4) $n=4, l=4, m=-4, s=-1/2$

Solution: For 4f orbital, $n=4$ and $l=3$

values of $m = -3, -2, -1, 0, +1, +2, +3$

Hence option (3) is the answer.

② The number of d-electrons retained in Fe^{+2} (At. no of Fe = 26) ion is.

1) 4

2) 5

3) 6

4) 3

Solution: configuration of $Fe^{+2} = 3d^6 4s^0 \Rightarrow 6$ electrons in d orbital.

Hence option (3) is the answer.

③ Which of the following statements in relation to the hydrogen atom is correct?

1) 3s is lower in energy than 3p orbital

2) 3p orbital is lower in energy than 3d.

3) 3s and 3p orbitals are of lower energy than 3d.

4) 3s, 3p and 3d orbitals all have the same energy.

Solution: The Aufbau principle is not applicable for the hydrogen atom.

Hence option (4) is the answer.

④ which of the following sets of quantum numbers represents the highest energy of atom?

1) $n=3, l=1, m=1, s=+1/2$

2) $n=3, l=2, m=1, s=+1/2$

3) $n=4, l=0, m=0, s=+1/2$

4) $n=3, l=0, m=0, s=+1/2$

Solution:

Maximum value of $(n+l)$ represents the highest energy of the orbital.

Hence option (2) is the answer.

⑤ The outer electron configuration of Gd (Atomic no. 64) is

1) $4f^4 5d^4 6s^2$

2) $4f^7 5d^1 6s^2$

3) $4f^3 5d^5 6s^2$

4) $4f^8 5d^0 6s^2$

Solution:

Gd shows a half-filled f^7 configuration

Hence option (2) is the answer.

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